CLAIMS

1. A drawing verification system comprising a server apparatus that establishes a session pertaining to verification of drawing information composed based on a facility specification, and a plurality of client apparatuses that connect to the session via a network and perform information communication,

wherein the verification in the session is performed by laying out rendering object information used to render an object included in the drawing information in a virtual 3D space based on layout information that corresponds to the drawing information and indicates a position and posture of the object,

the server apparatus comprises:

establishing means for establishing the session upon receiving a session start request from one of the plurality of client apparatuses storing the drawing information that is a verification target;

management means for managing state information indicating a state of the 3D space that is corresponding to the verification target drawing information for the session which is established by the establishing means;

first reception means for receiving information of a verification input made at each of the plurality of client apparatuses participating in the session;

change means for changing the state information upon receiving the information of the verification input by the first reception means; and

first transmission means for transmitting, to the client apparatuses connected to the session, shared information necessary to render the 3D space based on the state information, and

each of the plurality of client apparatuses comprises:

first recording means;

second reception means for connecting, on a condition that the verification target drawing information is stored in the first recording means, to the session and receiving the shared information transmitted by the first transmission means;

construction means for constructing at least part of the 3D space based on the shared information received by the second reception means, the rendering object information, and the layout information;

decision means for deciding a position and direction of a viewpoint at which the constructed 3D space is rendered;

output means for sequentially rendering and outputting views of binocular stereoscopic vision of the constructed 3D space rendered based on the viewpoint decided by the decision means;

presentation means for presenting the views of binocular stereoscopic vision rendered and output by the output means;

input means for accepting the verification input; and

second transmission means for transmitting, to the server apparatus, the information of the verification input accepted by the input means.

2. The drawing verification system according to claim 1, wherein the verification input accepted by the input means includes at least one of a change instruction of an object laid out in the constructed 3D space, a change instruction of at least one of a position and posture of an object laid out in the 3D space, and discussion information indicating contents of a discussion conducted for verification of the drawing information, and

the management means manages, by including in the state information based on a change of the state information according to the information of the verification input by the change means, history information indicating at least one of a change history of the object laid out in the 3D space, a change history of at least one of the position and posture of the object laid out in the 3D space, and a minute generated based on the discussion information.

3. The drawing verification system according to claim 2, wherein the second transmission means transmits the information of the verification input in association with identification information indicating the client apparatus to which the verification input has been input, or a user of the client apparatus, and

information pertaining to each verification input is associated with the identification information corresponding to the verification input in the history information.

4. The drawing verification system according to any one of claims 1 to 3, wherein the rendering object information includes 3D model data that is for an object represented by the rendering object information and that is composed based on CAD data of the object included in the drawing information.

5. The drawing verification system according to any one of claims 1 to 4, wherein the rendering object information is composed by including motion information that defines motions of at least some objects represented by the rendering object information.

6. The drawing verification system according to any one of claims 1 to 5, wherein the drawing information includes at least the rendering object information and the layout information corresponding to the drawing information, and

the construction means constructs at least part of the 3D space based on the shared information, and the rendering object information and the layout information that are stored in the first recording means.

7. The drawing verification system according to claim 6, wherein the drawing information includes authority information indicating whether to permit participation in the session, and

when the drawing information including the authority information that permits participation in the session is stored in the first recording means, each of the plurality of client apparatuses is controlled to connect to the session.

8. The drawing verification system according to claim 6, wherein the server apparatus further comprises second recording means for storing the layout information corresponding to the drawing information, and

the management means manages the state of the 3D space based on the layout information stored in the second recording means and the state information.

9. The drawing verification system according to any one of claims 1 to 5,

wherein the drawing information includes at least the rendering object information and the layout information corresponding to the drawing information, and

the server apparatus further comprises:

second recording means for storing the drawing information; and

update means for updating the drawing information stored in the second recording means based on the information of the verification input received by the first reception means.

10. The drawing verification system according to claim 9, wherein layout information composed of combinations and layouts of rendering object information for multiple types of objects is predefined as a template to be able to use in verification of the session, and

the server apparatus further comprises adjustment means for performing, when the same changes are made by more than a predetermined number of times to layout information based on the same template in a plurality of the sessions, at least one of changing the layout information and proposing a change in a session for verifying the drawing information that adopts the layout information.

11. A client apparatus that connects and performs information communication via a network to a session, which is established by a server apparatus for verification of drawing information designed based on a facility specification and to which a plurality of client apparatuses are able to connect,

wherein the verification in the session is performed by laying out rendering object information used to render an object included in the drawing information in a virtual 3D space based on layout information that corresponds to the drawing information and indicates a position and posture of the object,

the client apparatus comprises:

recording means;

connection means for connecting, on a condition that the drawing information which is a verification target is stored in the recording means, to the session;

reception means for receiving shared information necessary to render the 3D space in which verification is performed in the session;

construction means for constructing at least part of the 3D space based on the shared information received by the reception means, the rendering object information, and the layout information;

decision means for deciding a position and direction of a viewpoint at which the constructed 3D space is rendered;

output means for sequentially rendering and outputting views of binocular stereoscopic vision of the constructed 3D space rendered based on the viewpoint decided by the decision means;

presentation means for presenting the views of binocular stereoscopic vision rendered and output by the output means;

input means for accepting a verification input; and

transmission means for transmitting information of the verification input accepted by the input means.

12. The client apparatus according to claim 11, wherein the drawing information includes at least the rendering object information and the layout information corresponding to the drawing information, and authority information indicating whether to permit participation in the session,

the connection means controls to connect to the session when the verification target drawing information stored in the recording means includes the authority information that permits participation in the session, and

the construction means constructs at least part of the 3D space based on the shared information, and the rendering object information and the layout information that are stored in the recording means.

13. The client apparatus according to claim 11, wherein the drawing information includes a plurality of objects that are laid out at different locations in the 3D space,

the verification input includes an input that indicates a partial object

among the plurality of objects,

the shared information includes information to differ a presentation mode of the partial object indicated in one of the plurality of client apparatuses, and

the transmitting means transmits the information of the verification input in association with identification information indicating the client apparatus to which the verification input has been input, or a user of the client apparatus.

14. A program for causing a computer to function as each means of the client apparatus according to any one of claims 11 to 13.

15. A computer-readable recording medium that records the program according to claim 14.

16. A server apparatus that establishes a session pertaining to verification of drawing information composed based on a facility specification and implements information communication between a plurality of client apparatuses connected to the session via a network,

wherein the verification in the session is performed by laying out rendering object information used to render an object included in the drawing information in a virtual 3D space based on layout information that corresponds to the drawing information and indicates a position and posture of the object,

the server apparatus comprises:

management means for managing state information indicating a state of the 3D space that is a verification target for the session, which is established upon receiving a session start request from one of the plurality of client apparatuses;

reception means for receiving information of a verification input made at each of the plurality of client apparatuses participating in the session;

change means for changing the state information upon receiving the information of the verification input by the reception means; and

transmission means for transmitting, to the client apparatuses connected to the session, shared information necessary to render the 3D space based on the state information,

wherein the verification includes at least one of a change instruction of an object laid out in the 3D space, a change instruction of at least one of a position and posture of an object laid out in the 3D space, and discussion information indicating contents of a discussion conducted for verification of the drawing information, and

the management means manages, by including in the state information based on a change of the state information according to the information of the verification input by the change means, history information indicating at least one of a change history of the object laid out in the 3D space, a change history of at least one of the position and posture of the object laid out in the 3D space, and a minute generated based on the discussion information.

17. A server apparatus that establishes a session pertaining to verification of drawing information composed based on a facility specification and implements information communication between a plurality of client apparatuses connected to the session via a network,

wherein the verification in the session is performed by laying out rendering object information used to render an object included in the drawing information in a virtual 3D space based on layout information that corresponds to the drawing information and indicates a position and posture of the object,

the drawing information includes at least the rendering object information and the layout information corresponding to the drawing information, and

the server apparatus comprises:

management means for managing state information indicating a state of the 3D space that is a verification target for the session, which is established upon receiving a session start request from one of the plurality of client apparatuses;

reception means for receiving information of a verification input made at each of the plurality of client apparatuses participating in the session;

change means for changing the state information upon receiving the

information of the verification input by the reception means;

transmission means for transmitting, to the client apparatuses connected to the session, shared information necessary to render the 3D space based on the state information;

update means for updating the drawing information based on the information of the verification input received by the reception means; and

adjustment means for performing, when the same changes for the same object are made by more than a predetermined number of times, at least one of changing the layout information and proposing a change in a session for verifying the drawing information that adopts the layout information.

18. The server apparatus according to claim 17, further comprising recording means for storing the drawing information, and

wherein the update means updates the drawing information stored in the recording means.

19. A server apparatus that establishes a session pertaining to verification of drawing information composed based on a facility specification and implements information communication between a plurality of client apparatuses connected to the session via a network,

wherein the verification in the session is performed by laying out rendering object information used to render an object included in the drawing information in a virtual 3D space based on layout information that corresponds to the drawing information and indicates a position and posture of the object, and

the server apparatus comprises:

establishing means for establishing, upon receiving a session start request from one of the plurality of client apparatuses storing the drawing information that is a verification target, the session to which the client apparatus storing the drawing information is able to connect;

management means for managing state information indicating a state of the 3D space that is corresponding to the verification target drawing information

for the session which is established by the establishing means;

reception means for receiving information of a verification input made at each of the plurality of client apparatuses participating in the session;

change means for changing the state information upon receiving the information of the verification input by the reception means; and

transmission means for transmitting, to the client apparatuses connected to the session, shared information necessary to render the 3D space based on the state information.

20. The server apparatus according to claim 19, wherein the drawing information includes authority information indicating whether to permit participation in the session, and

the connection of the client apparatus to the session is implemented on a condition that the verification target drawing information including the authority information that permits participation in the session is stored.

21. A control method of a server apparatus that establishes a session pertaining to verification of drawing information composed based on a facility specification and implements information communication between a plurality of client apparatuses connected to the session via a network,

wherein the verification in the session is performed by laying out rendering object information used to render an object included in the drawing information in a virtual 3D space based on layout information that corresponds to the drawing information and indicates a position and posture of the object, and

the control method comprises:

an establishing step of establishing, upon receiving a session start request from one of the plurality of client apparatuses storing the drawing information that is a verification target, the session to which the client apparatus storing the drawing information is able to connect;

a management step of managing state information indicating a state of the 3D space that is corresponding to the verification target drawing information

for the session which is established in the establishing step;

a reception step for receiving information of a verification input made at each of the plurality of client apparatuses participating in the session;

a change step of changing the state information upon receiving the information of the verification input in the reception step; and

a transmission step of transmitting, to the client apparatuses connected to the session, shared information necessary to render the 3D space based on the state information.

22. The control method according to claim 21, wherein the drawing information includes authority information indicating whether to permit participation in the session, and

the connection of the client apparatus to the session is implemented on a condition that the verification target drawing information including the authority information that permits participation in the session is stored.

23. A program for causing a computer to function as each means of the server apparatus according to any one of claims 16 to 20.